

## Short Communication

# The susceptibility of *Escherichia coli* strains to essential oils of *Rosmarinus officinalis* and *Eucalyptus globulus*

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Essential oils are frequently used for flavour and fragrance in the perfume, pharmaceutical, cosmetic and food industries. They are also suitable raw material for production of new synthetic agents. The antibacterial activity of the essential oils obtained by steam distillation of *Rosmarinus officinalis* L and *Eucalyptus globules* collected in south Morocco was studied by micro-atmospheric technique against *Escherichia coli* CIP54127 and *E. coli* isolated from urine and resistant to several antibiotics. Both essential oils were effective against the two strains bacteria in particularly against *E. coli* CIP54127. MIQ of both oils ranged from 60 to 70  $\mu$ l for both bacteria. In conclusion, results show that essential oils are effective and could be considered as a natural antimicrobial source that can be used on production of natural antimicrobial agents.

**Key words:** Essential oils, antibacterial activity, *Rosmarinus officinalis*, *Eucalyptus globules* *Escherichia coli*.

## INTRODUCTION

Biological active natural compounds are of interest to pharmaceutical industry for the control of human diseases of microbial origin and for the prevention of lipid peroxidase damage, which has been implicated in several pathological disorders, such as coronary atherosclerosis, Alzheimer's disease, cancerogenesis as well as in ageing processes (Smith et al., 2002; Van de Vijver et al., 1997). Essential oils are volatile compounds

of plant secondary metabolism, and may act as phytoprotective agents (Falério et al., 1999). These compounds also have insecticide, antifungal and antibacterial activity which is important both for food preservation and the control of human and plant diseases of microbial origin (Pattanaik et al., 1996). This aspect assumes particular relevance, since an increased resistance of some very dangerous bacterial strains to the most common antibiotics has recently been observed (Mimica- Dukic et al., 2003; Adam, 2002) . With respect to this, we report the antibacterial activity of the essential oils extracted from Moroccan species, namely *Rosmarinus officinalis* L and *Eucalyptus globulus* and their effect against *Escherichia coli*.

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**Table 1.** Antibacterial activity of the essential oils *R.officinalis* L. and *E.globulus* using micro-atmospheric.

| Minimal inhibitory quantity |                      |                   |
|-----------------------------|----------------------|-------------------|
| Bacteria                    | <i>R.officinalis</i> | <i>E.globulus</i> |
| <i>E.coli</i> CIP           | 65                   | 60                |
| <i>E.coli</i>               | 70                   | 60                |

## MATERIALS AND METHODS

### Extraction of the essential oils

Plants materials were subjected to steam distillation for 3 h using a Clevenger-type apparatus. Essential oils were collected after decantation.

### Antibacterial assay

The micro-organisms used in this study were *Escherichia coli* strain CIP 54127 (a gift from Pasteur Institute) and another strain of *E. coli* isolated from urine sample in the Biological Center of the Pasteur Institute. Strains were maintained in Kligler agar at 4°C.

The *E. coli* isolated from urine was suspended in sterile buffer water.  $10^8$  cfu/ml was inoculated onto the surface of Mueller Hinton agar. The Pasteur antibiotic discs were placed on the inoculated plates and incubated at 37°C for 24 h. Antibiotics used are amoxicilline (AMX), ciprofloxacin (CIP), AMX+acide clavulanique, tobramycin (TM), furane (FT), acide nalidixique (NA), céfalotine (CF) and ticarcilline (TIC).

To access the antibacterial properties of the oil, a suspension of the test bacteria ( $5 \mu\text{l}$  of  $10^8$  cfu/ml) was distributed on the surface of C.E.L.D. agar. Filter paper discs (20 mm in diameter) were impregnated with various quantities of the oils (from 0 to 100  $\mu\text{l}$ ) and placed on top of the agar and then incubated at 37°C for 24 h. All the tests were performed in duplicate and repeated triplicate.

## RESULTS AND DISCUSSION

The *E. coli* isolated from urine sample show resistance against the majority of used antibiotics in particularly against AMX, AMC and Furane. Both the *E. coli* isolated

from urine and *E. coli* CIP 54127 are sensitive to the two essential oils. The minimum inhibitory concentration (MIC) range from 60 to 70  $\mu\text{l}$  (Table 1).

In order to compare the essential oils effectiveness and the micro-organism susceptibility to the same essential oils, we applied the notation used by Benjlali et al (1984). Based on the notation, the degree of effectiveness of the essential oils on both *E. coli* strains with MIC range from 60 to 70  $\mu\text{l}$  is 1 ( $50 < \text{MIQ} < 100$ ). *E. globulus* and *R. officinalis* essential oils presented approximately similar effectiveness degree.

In conclusion, *E. coli* strain that is resistant to several antibiotics is susceptible to the essential oils of *R. officinalis* L. and *E. globulus*. Therefore, *E. globulus* and *R. officinalis* essential oils can be used in pharmaceutical industry for production of new synthetic agents in the treatment of the infection disease.

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